II. Remarks

Claims 1-21 and 31-33 are pending in this application. Of these, claims 1, 2, 4, 7, 9, 12, 13, 15, 19, 31, and 32 stand rejected for anticipation, while claims 1-3, 5, 6, 8, 10-14, 16-18, 20, 21, and 33 stand rejected for obviousness. By this paper, Applicants have amended independent claims 1, 10, 12, 17, 20, and 31 in order to more particularly point out and distinctly claim that which Applicants regard as their invention, 35 U.S.C. §112, second paragraph.

Specifically, claim 1 has been amended to recite the upwardly curved central arc portion and at least one pair of upwardly curved peripheral arc portions as being respectively defined by an upper surface of the main leaf spring. Claim 7, which depends from claim 1, has been amended to more closely correlate with Applicants' disclosure at page 5, lines 3-5, wherein Applicants describe the main leaf spring as "progressively and continuously engaging the load plate to achieve a hard spring rate and a smooth transition from the soft spring rate to the hard spring rate" (emphasis added). Claim 7 as amended further features proper antecedent basis for "contact length" while further reciting that the contact length "increases with higher loads," as Applicants describe at page 11, lines 17-23. Claims 10, 17, and 20 have also been amended for proper antecedent basis.

Similarly, claim 12 now recites the main leaf spring as having an upper and a lower surface, wherein the upper surface of the main leaf spring defines "a continuously upwardly curved central arc portion...," and wherein the load plate mounted beneath the main leaf spring "for direct contact with the lower surface" of the main leaf spring. Claim 12 also now provides proper antecedent basis for "contact length" while further clarifying the manner in which the contact length increases when a further increased load is applied to the main leaf spring.

Independent claim 31 has likewise been amended to recite the main leaf spring's upper and lower surfaces, with the upper surface of the main leaf spring "defining a continuously upwardly curved central arc portion having a first radius and at least one pair of upwardly curved peripheral arc portions having radii different from said first radius." As in amended claim 12, claim 31 now clarifies the manner in

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which the lower surface of the main leaf spring "directly contacts said load plate along a contact length so that the contact length between said main leaf spring and said load plate increases with higher loads."

Support for the above amendments to claims 1, 7, 12, and 31 is found, for example, in the Drawings and at page 11, lines 17-23, wherein Applicants teach that "the contact length between the main leaf spring and the load plate generally increases with higher loads." No new matter has been added by these amendments. Reconsideration and further examination of claims 1-21 and 31-33 are respectfully requested.

Turning to the substantive rejections of the outstanding Office action, claims 1, 2, 4, 7, 9, 12, 13, 15, 19, 31, and 32 stand rejected as anticipated by U.S. Patent No. 4,802,659 ("Hope"), while claims 5, 6, 8, 10, 11, 16-18, 20, 21, and 33 stand rejected for obviousness over Hope, either alone or in combination with one of U.S. Patents No. 5,938,221 ("Wilson"), No. 4,969,633 ("Ryan"), or No. 4,801,129 ("Wells").

As noted above, independent claims 1, 12, and 31 now expressly recite that the upper surface of the main leaf spring defines both the continuously upwardly curved central arc portion and the at least one pair of upwardly curved peripheral arc portions, wherein the peripheral arc portions have radii that are not equal to the radius of the central arc portion. Claims 1, 12, and 31 now further require that the central arc portion, as defined by the upper surface of the main leaf spring, be "continuously upwardly curved."

In contrast, Hope teaches a composite leaf spring having "a thickened central zone, adjacent tapered zones and end zones" (Hope, abstract, ll.. 2-4). As clearly seen in Figures 2 and 3 of Hope, and is further emphasized beginning at the bottom of column 1, "the surfaces of the central zone are flat and parallel to the longitudinal axis of the spring." Still further Hope teaches tapered transition zones for featuring upper surfaces 7 that are themselves convex (as indicated at Hope reference numeral 11). (Hope, col. 3, ll. 12-14). Simply stated, Hope teaches a flat central zone bordered by convex transitions, as defined by the upper surface of the spring

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as illustrated in Hope's several figures. As such, Hope is wholly non-responsive to the express limitation in each of Applicants' independent claims 1, 12, and 31, requiring that the upper surface of the leaf spring define a "continuously upwardly curved central arc portion," i.e., a concave rather than a flat or convex arc portion of the leaf spring. Indeed, as stated at column 2, lines 34-41, Hope is directed to providing a central zone of increased thickness by which to avoid "large local bending stresses on the leaf when "standard metal spring clamps are used in conjunction with a composite leaf spring." Thus, Hope states that "these stresses may be reduced by increasing the thickness of the spring but this usually results in an increase in the stiffness of the spring. The present invention enables the thickening of the spring to be achieved with little or no change in the spring rate or stiffness" (Hope, col. 2, ll. 34-41). Simply stated, if the central zone of the leaf spring may be thickened as taught by Hope, "with little or no change in the spring rate or stiffness" of the resulting composite leaf spring, then the central zone itself does not function as a spring to provide the recited variable rate leaf spring assembly disclosed and claimed by Applicants.

As to the further limitation recited in independent claims 12 and 31, and in dependent claim 7, that a load plate progressively engages the lower surface of the leaf spring along a contact length that itself increases with higher applied loads, Hope fails to teach or suggest any progressive or gradual engagement whatsoever between the leaf spring and the lower spring clamp. Indeed, because the central zone of Hope's leaf spring remains essentially flat (recall that Hope's spring rate is defined by that portion of the spring outside its central zone), the "contact length" of engagement between the lower spring clamp and the lower surface of Hope's leaf spring necessarily remains constant, irrespective of increasing load. Thus, Applicants respectfully submit that this rejection of claims 7, 12, and 31 is properly withdrawn.

With respect to claims 8 and 18, which stand rejected as being unpatentable over Hope, as noted above, Hope neither teaches nor suggests the use of a load plate which progressively engages the lower surface of the main leaf spring with increasing applied load. To the contrary, as seen, for example, in Figure 2 of Hope,

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the concave portions 12 forming the lower surface transition between Hope's central zone and the adjacent tapered zones preclude any gradual or "progressive" engagement of the lower spring clap with the lower surface of the leaf spring. Indeed, as noted above, because Hope's objective is to provide a thickened central zone, the thickening of which is intended to effect "little or no change in the spring rate or stiffness" of the leaf spring, Hope necessarily diverges from Applicants' teaching of a flexing of Applicants' central arc portion of the spring and its concomitant progressive engagement with the load plate. Thus, claims 8 and 18 are patentable over Hope, and this rejection must be withdrawn.

Regarding claims 5 and 16, each of which stands rejected for obviousness over Hope in view of either Wilson or Ryan, each of these claims incorporate by reference the express limitations of their respective base claims and, therefore, are neither anticipated nor rendered obvious by Hope, either alone or taken in combination with Wilson or Ryan. Specifically, neither Wilson nor Ryan cures the deficiencies of Hope with respect to base claims 1 and 12. Accordingly the rejections of claims 5 and 6 set forth in numbered paragraphs 6 and 7 of the outstanding Action must be withdrawn.

Claims 6 and 17 also stand rejected as being unpatentable over Hope in view of Ryan. Claims 6 and 17 respectively recite that the mounting eyelet of the at least one integral mounting end includes "an out-of-mold metallic insert." Thus, claims 6 and 17 each expressly require both an integral mounting eyelet and a metallic insert that is not integrally-formed with the eyelet. As noted by the Examiner in numbered paragraph 7 of the outstanding Action, Hope is silent as to the structure of the at least one integral mounting end. And, as for the applied secondary reference, Ryan merely provides that "each end of section 3 is provided with a metal or plastic bushing for having an opening to receive a connecting member to attach the spring to a vehicle in the conventional manner" (Ryan, col. 2, ll. 59-63). As seen in Figure 2 of Ryan and the accompanying text beginning at column 3, line 22, in making the composite leaf spring, Ryan teaches the winding of continuous strands or rovings 14 of fibers "wound helically around the spaced bushings 4." Ryan teaches that the resulting wound structure is thereafter placed in the cavity of a

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mold, and resin is injected into the mold to thereby integrally form the composite leaf spring around/with the bushings 4 (by insert-molding). As such, Ryan itself diverges from Applicants' claimed invention, wherein only the eyelet is integrally formed with the main leaf spring end, whereupon an out of mold metallic insert is seated within the previously-integrally-formed mounting eyelet and the end of the leaf spring. Given that Hope's acknowledged deficiency cannot be cured by Ryan's divergent teaching, Applicants respectfully submit that the obviousness rejection of claims 6 and 17 must be withdrawn.

Claims 10, 11, 20, 21, and 33 stand rejected as being unpatentable over Hope in view of Wells. Each of these claims further features "an intermediate member spaced between said main leaf spring and said load plate." As noted above, Hope's central zone is not itself intended to flex, but rather, is merely a "thickened" zone to avoid stress concentration when using metal spring clamps. Hope provides no motivation or suggestion to one of ordinary skill to add the "resilient wedge insert" taught by Wells, because Hope solves the same problem presented by Wells -- the "damage to or dislocation of the reinforcing filaments or resin matrix of the leaf spring" when using conventional metal spring clamps (Wells, col. 1, ll. 6-10) -- by making the central zone thicker and further providing a particular transition to the adjacent tapered zones of the leaf spring. Nor does Wells otherwise cure the above-stated deficiencies of Hope with respect to other intervening claims limitations discussed above. Accordingly, Applicants respectfully submit that claims 10, 11, 20, 21, and 33 are patentable over the combination of Hope and Wells.

Further, claim 33 recites the step of "separating said main leaf spring from said load plate under empty payload conditions with an intermediary member," while claim 31 otherwise recites the nature of the engagement between the leaf spring and the load plate when applying "an increased downward force to the main leaf spring." Because the wedge insert of Wells is described as being "adapted to contact this leaf spring along substantially the entire longitudinal dimension of the inner channel" of the clamp base (Wells, col. 3, ll. 22-26), Wells expressly teaches away from the first and second applying steps of intervening base claim 31. For at least this

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additional reason, the rejection of claim 33 for obviousness over Hope in view of Wells must also be withdrawn.

Claims 1-3 and 12-14 are also rejected as being patentable over U.S. Patent No. 3,849,037 ("Downs") in view of Hope.

As noted above, claims 1 and 12 now expressly require that the upper surface of the main leaf spring defines "a continuously upwardly curved central arc portion... and at least one pair of upwardly curved peripheral arc portions." As best seen in Figure 4 of Downs, and described beginning at column 3, line 59, Downs' leaf spring

> is formed so that it has an elongated radially outward facing convex portion 66 intermediate to axially outwardly facing convex end portion 68 with tight reverse or concave bends that provide spaced seat portions 70 joining the intermediate portion 66 and the end portions 68.

(Downs, col. 3, ll. 59-66). Further, as recited beginning at column 4, line 8, the intermediate spring portion 66 of Downs' leaf spring biases a seal in one direction while the end portions 68 bias the rotary engine's corner seals in other directions ("against the end walls 18 and 20"). Thus, the leaf spring as taught in Downs includes three single-rate spring sections, each separated by "spaced seat portions 70." Simply stated, the leaf spring of Downs is simply not a "variable rate multi-arc leaf spring capable of generating "a continuous variable spring deformation rate including a soft spring rate and a hard spring rate," as those terms must necessarily be construed in the context of a Applicants' disclosed variable rate leaf spring assembly for an automobile suspension.

Still further, with respect to the rejection of claims 12-14, Applicants note that the leaf spring taught in Downs engages an apex seal 50 which is itself a resilient member that in no way functions in the manner disclosed and claimed by Applicants, wherein increasing loads applied through the load plate produces a progressively increasing contact length between the load plate and the leaf spring's central arc portion. For at least the foregoing reasons, claims 1-3 and 12-14 are patentable over Down in view of Hope.

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For at least the foregoing reasons, Applicants respectfully submit that claims 1-21 and 31-33 patentably define over the prior art of record in this application, and the allowance of claims 1-21 and 31-33 is courteously solicited.

Respectfully submitted,

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Date

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Attachment: Replacement Sheet(s) of Drawings
Annotated Sheet(s) of Drawings

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